REMARKS

Claims 47-56 are pending in the present application. In the Office Action mailed November 2, 2005, the Examiner rejected claim 53 under 35 U.S.C. §112, second paragraph. The Examiner next rejected claims 47-49 and 51-53 under 35 U.S.C. §102(e) as being anticipated by Liu (USP 6,043,652).

This supplemental amendment supplements the amendment filed previously hereto on February 2, 2006. For purposes of this amendment, it has been assumed that the amendments made in the earlier filing have been entered. For matter of completeness, the remarks set forth hereunder include the remarks as set forth in the earlier filed amendment as well as additional remarks.

The Examiner rejected claim 53 under 35 U.S.C. §112, second paragraph, and stated that there is insufficient antecedent basis for the limitation "said data" in line 4 of claim 53. *Office Action, Nov. 02, 2005, p. 2.* Applicant respectfully disagrees. Claim 53, in line 2, calls for providing data in a first spatial distribution of data points. Therefore, the element of claim 53 calling for pre-multiplying said data has an antecedent basis in claim 53. The Examiner further stated, "the claims fail to give proper antecedence to the 'first spatial distribution of data points' or 'second spatial distributions' recited previously in claim 53." Id. Claim 53 calls for, in part, providing data in a first spatial distribution of data points and providing a second spatial distribution of data points. Therefore, an antecedent basis in the first and second spatial distributions of data points is provided in claim 53. Further, since the first and second distributions of data points are "recited previously in claim 53," the previous recitations provides the antecedent bases. As such, Applicant believes that claim 53 satisfies the requirements of 35 U.S.C. §112, second paragraph and requests withdrawal of the rejection thereof.

The Examiner rejected claim 47 under 35 U.S.C. §102(e) as being anticipated by Lui. However, while Liu and the current invention both teach image reconstruction, there are numerous fundamental differences between the claimed invention and that taught by Liu. Specifically, Liu explicitly teaches direct image reconstruction while the current invention is specifically designed to overcome the shortcomings of direct reconstruction. Therefore, before addressing each of the claims relative to the disclosure of Liu, Applicant believes it beneficial to briefly summarize the differences between the present invention and that disclosed by Liu.

Liu discloses a direct reconstruction process of MR data processing. One of ordinary skill in the art will recognize, however, that direct reconstruction may be an inefficient method of image reconstruction. That is, by including the Fourier Transform within the matrix that will be

inverted, the amount of data must be limited or the matrices will become too large for computation. Specifically, the direct reconstruction process disclosed by Liu involves the application of a Fourier Transform to a first and a second spatial distribution. As is customary and taught by Liu, limiting the data by only applying the process to "data lines" is necessary. That is, the data must be limited to one dimension because the process, when applied to multiple dimensions, requires computation using complex matrices on the order of tens of thousands by tens of thousands. One of ordinary skill in the art will recognize that computation of matrices of that order is not feasible. Therefore, Liu is directed to one dimension, i.e. "data lines."

The current invention, on the other hand, does not use direct reconstruction and thereby allows reconstruction of data in two or more dimensions. The current invention, while remaining in the Fourier Domain, interpolates a point from one grid to another, i.e. from the uniform grid to the non-uniform grid, and only then performs the Fourier Transform such as a Fast Fourier Transform. Therefore, one difference from the process of Liu in that interpolation occurs before a Fourier Transform is applied. This allows reconstruction of data in multiple dimensions because the interpolation of data in the Fourier Domain creates matrices of a size that is computationally feasible.

Regarding claim 47, Applicant has amended the claim to clarify the invention. Specifically, Applicant has amended claim 47 to clarify that the first spatial distribution and the second spatial distribution are in a first domain. Furthermore, following resampling in the first domain, the resampled data is transformed to a second domain. Accordingly, Applicant believes claim 47 to clearly define the invention over the art of record.

Specifically, Liu performs a Fourier Transform simultaneously with any inversion or resampling. That is, Liu teaches including the Fourier Transform within the matrix of coefficients. The Examiner asserts that Liu teaches a "P-matrix generator (i.e. first spatial distribution of data points) [that] generates a matrix P" and an "X-matrix generator (i.e. second spatial distribution of data points) [that] generates a diagonal matrix X, by multiplying P*x)." *Office Action, Nov. 2, 2005, p. 3.* Liu teaches generation of matrix P in Equation 12 as $P=H^{-1}A^{T}D$. Prior to transposition, matrix A includes elements defined by $A_{nm} = e^{-i2\pi k_n t_\tau}$. One of ordinary skill in the art will recognize that the creation of the A matrix necessarily includes the Fourier Transform. *See Liu, Eqn. 3.* Therefore, Liu does not teach resampling, in the first domain, data from said first spatial distribution onto said second spatial distribution where the first and second distributions are in the first domain and that only after resampling is any resampled data transformed into a second domain. Instead Liu teaches directly transforming raw

data to image data using the 'P' matrix. In contrast, Applicant claims that the first and second spatial distributions are in the same domain, i.e. raw data domain. Only after resampling is the data Fourier transformed to a second domain, i.e. image domain.

Accordingly, that which is called for in claim 47 is not shown, disclosed, taught, or suggested in the art of record. As such, Applicant believes claim 47, and the claims which depend therefrom, are patentably distinct over the art of record.

The Examiner rejected claim 53 under 35 U.S.C. §102(e) as being anticipated by Liu. Applicant has amended claim 53 to clarify the invention. Specifically, Applicant has amended claim 53 to clarify that the first spatial distribution and the second spatial distribution are in a first domain. Furthermore, following resampling in the first domain by multiplying the data by a band-diagonal density pre-compensation matrix which includes at least one element having a negative value, the resampled data is transformed to a second domain.

As stated above, Liu does not teach resampling, in the first domain, data from said first spatial distribution onto said second spatial distribution where the first and second distributions are in the first domain and that only after resampling is any resampled data transformed into a second domain. Liu further fails to teach that the band-diagonal density pre-compensation matrix is in the same domain as the first and second spatial distributions

Accordingly, that which is called for in claim 53 is not shown, disclosed, taught, or suggested in the art of record. As such, Applicant believes claim 53, and the claims which depend therefrom, are patentably distinct over the art of record.

Therefore, in light of at least the foregoing, Applicant respectfully believes that the present application is in condition for allowance. As a result, Applicant respectfully requests timely issuance of a Notice of Allowance for claims 47-56.

Applicant appreciates the Examiner's consideration of these Amendments and Remarks and cordially invites the Examiner to call the undersigned, should the Examiner consider any matters unresolved.

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Respectfully submitted,

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